



CUSTOM MANUFACTURED FOR RADIO SHACK  
A TANDY CORPORATION COMPANY

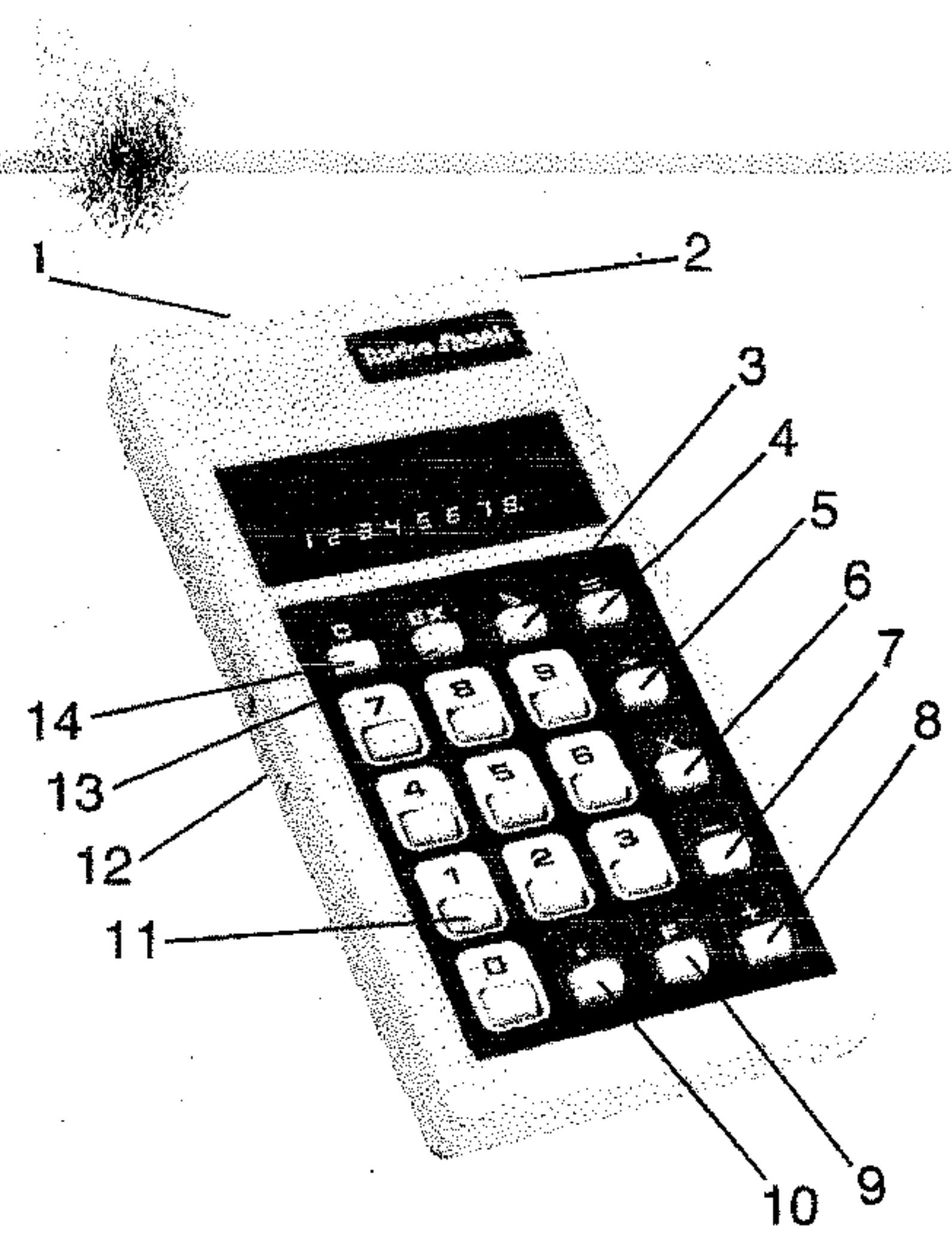
**Welcome to the world of  
Radio Shack reliability!**

The versatility of your EC-415 makes it "the answer" to many different kinds of problems.

Problems like squares, square roots and reciprocals...or percentage problems like mark-on and discount (both automatic with the EC-415). Your new calculator simplifies these with a fully addressable memory, automatic constants, register exchange and sign change.

Your Radio Shack calculator uses one of today's most sophisticated electronic devices—the micro-electronic silicon chip. Although this chip is no larger than a fleck of confetti, its minute surface is programmed with the capabilities needed for solving everyday problems. The supplier of this chip, Rockwell International, has had more experience with these remarkable devices than anyone else in the industry.

This instruction manual will help you understand the various key functions and the operation of your calculator.



1. AC jack (for optional AC adapter, Cat. No. 65-702)
2. Battery compartment (door on back side)
3. Percent and Square Root Key
4. Equal and Memory Recall Key
5. Divide and Reciprocal Key
6. Multiply and Square Key
7. Subtract and Subtract-from-Memory Key
8. Add and Add-to-Memory Key
9. Function and Clear Function Key
10. Decimal Point Entry and Change Sign Key
11. Number Entry Keys
12. On-Off Switch
13. Display/Register and Display/Memory Exchange Key
14. Clear and Memory Clear Key

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## GENERAL INFORMATION

### Battery Installation

Your calculator requires a 9-volt rectangular battery for its power. Remove the battery access door. Snap the battery clips onto the battery. Place the battery in the calculator with the bottom toward the adapter jack.

### Battery Replacement

When the battery approaches the end of its useful life (See the Service Tip on page 4), replace it with a new standard 9-volt transistor radio battery; we recommend Radio Shack's 23-151 or 23-553 for extra-long life.

### Operation from AC Power

Your calculator may also be operated from regular household or office power with an AC adapter, Radio Shack's Catalog No. 65-702. The AC adapter can be used with or without a battery installed in the calculator. If the AC adapter is plugged into the calculator, it must also be plugged into an electrical outlet or the calculator will not work.

**CAUTION: To avoid possible damage  
to your calculator, use only the AC  
adapter noted.**

### Service Tip

Your calculator is designed and manufactured to give you reliability and trouble-free service. Consequently, very few of our calculators are returned for repairs. Most of those returned are found to be due to battery problems. Therefore, to avoid the inconvenience of returning your calculator and being without it needlessly, we suggest you **DO THE FOLLOWING BEFORE YOU SEND IT TO US FOR SERVICE:**

1. Try a **new, fresh** battery in your calculator.
2. If you have an AC adapter, try operating your calculator with it. Be sure the AC adapter is plugged into an AC outlet. If the calculator functions correctly your battery is probably dead and should be replaced.
3. Check the battery connector to be sure it is "snapped" securely onto the battery terminal.

If, after following the above suggestions, your calculator does not function correctly please return it to any Radio Shack store for repair.

### CARE AND MAINTENANCE

Your calculator, having been manufactured with precision parts, deserves the same care that you give your other prized possessions.

Here are some practical tips:

1. Keep your calculator away from moisture and liquids.
2. Never use a dry or wet cleaner of any kind on the high impact plastic case. Simply wipe the case with a clean dust cloth.
3. Do not drop or subject your calculator to heavy shocks or vibration.
4. Avoid exposing your calculator to extreme heat or cold. Keep it out of direct, intense sunlight and away from heating devices.
5. When not in use, turn the calculator off. If you have a carrying case, keep your calculator inside it.
6. For operation from AC power, use only Radio Shack's AC adapter 65-702.
7. Do not attempt to repair the calculator yourself. Its parts are replaceable, but not repairable.

When discarding a battery, **NO NOT BURN IT, FOR IT MAY EXPLODE.**

## OPERATION

### ON/OFF SWITCH

Turning the calculator on automatically clears the calculator (including its memory) to zero. The calculator is then immediately ready for use in solving problems.

### DISPLAY

Your calculator will accept and display any positive or negative number between 0.0000001 and 99999999. A negative number is indicated by a minus sign on the left side of the display:  $-3.1469782$ , for example. Results in excess of 8 digits cause an overflow condition which is indicated by illuminating all eight decimal points: **1.2.3.4.5.6.7.8.**, for example, and the first 8 (most significant) digits of your answer are saved. (In this circumstance all keys become inoperative except the clear key, **□**. See Clear Operations, Overflow Conditions, and Wrap-Around Decimal.)

If a number has been entered in the memory, a Memory Indicator dot is displayed in the far left position of the display:  $-.123.45678$  or  $.0.3334567$ , for example.

## EXPLANATION OF KEYS

Your EC-415 calculator has 20 keys, including a special "second function" key that allows each function key to have two separate uses. The first (primary) use is identified directly above the key; the second (secondary) use is indicated above the primary identification. In this manual, the first use is represented (except for digits) by enclosing the identification in a box, **□**; the second use, by enclosing the identification in parentheses, **( )**. The following explanation will help you understand the operation and uses of each key.

### Number Entry and Decimal Point Keys

Depressing any number entry key enters that digit into the calculator and causes it to appear on the display. Turn your calculator on and depress the 2 and 4 keys. The display shows the following:

| Keyboard Entry | Display |
|----------------|---------|
| 2              | 2.      |
| 4              | 24.     |

When you want to enter a decimal number, depress the **□** key following the number after which you want the

decimal point located. To enter 1.6:

| Keyboard Entry | Display |
|----------------|---------|
| 1              | 1.      |
| .              | 1.      |
| 6              | 1.6     |

#### Arithmetic Function and Answer Keys

The arithmetic function keys,  $\oplus$ ,  $\ominus$ ,  $\times$  and  $\div$ , enter the desired arithmetic operation to be performed by the calculator. The answer to such an operation is obtained by depressing one of the answer keys,  $\blacksquare$  or  $\%$ , or by another depression of an arithmetic function key. Because this calculator has a FLOATING DECIMAL, it automatically places the decimal point in the correct position in your answers.

#### Clear Key

$\square$ : Depressing the  $\square$  key clears the display of erroneous entries, cancels overflow conditions, or clears the calculator of stored numbers and functions. (See Clear Operations, page 21, for detailed instructions on use of the  $\square$  key.)

#### Register Exchange Key

$\blacksquare$ : Depressing the  $\blacksquare$  key interchanges the contents of the display and the working register.

#### Function Key

$F$ : Depressing the  $F$  key conditions the calculator to interpret the next key depressed in accordance with the function identified above the primary identification. The secondary function is automatically canceled after execution of any second function operation.

## ADDITION AND SUBTRACTION

Your EC-415 performs addition and subtraction with algebraic logic. This means that your calculator works the same way you think or would write a problem. For example,  $5 + 4 - 3 = 6$  is entered exactly the way the problem is stated.

### Keyboard Entry

| Keyboard | Entry | Display |
|----------|-------|---------|
| 5        |       | 5.      |
| +        | 5     | 4.      |
| 4        |       | 9.      |
| -        | 3     | 3.      |
| 3        |       | 6.      |
| =        |       |         |

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Notice that the display shows each new numerical entry as you depress the number entry keys, and the result of the previous arithmetic calculation when an arithmetic function key is depressed.

If you want to use an answer in further calculations, there is no need to re-enter the number. Just depress the desired arithmetic function key for the next operation and enter another number. For example, to subtract 39 from the preceding answer, just enter  $\square$  39  $\square$ .

### Keyboard Entry

| Keyboard | Entry | Display |
|----------|-------|---------|
| 6        |       | 6.      |
| -        | 6     | 39.     |
| 39       |       | -       |
| =        |       | 33.     |

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## MULTIPLICATION AND DIVISION

Multiplication and division problems are also entered the same way you think of would write a problem. For example,  $7 \times 9 \div 6 = 10.5$  is entered as stated.

| Keyboard Entry   | Display |
|------------------|---------|
| 7                | 7.      |
| $\boxed{\times}$ | 7.      |
| 9                | 9.      |
| $\boxed{\div}$   | 63.     |
| 6                | 6.      |
| $\boxed{=}$      | 10.5    |

## MIXED (CHAIN) CALCULATIONS

Addition, subtraction, multiplication and division can be intermixed in any desired combination. All four arithmetic operations are used in the following example:

$$\frac{(5 + 6) 7 - 8}{9} = 7.6666666$$

| Keyboard Entry   | Display   |
|------------------|-----------|
| 5                | 5.        |
| $\boxed{+}$      | 6.        |
| 6                | 6.        |
| $\boxed{\times}$ | 11.       |
| 7                | 7.        |
| $\boxed{-}$      | 77.       |
| 8                | 8.        |
| $\boxed{\div}$   | 69.       |
| 9                | 9.        |
| $\boxed{=}$      | 7.6666666 |

## REPEAT OPERATIONS

The repeat operation capability of your calculator is a convenient, time-saving feature that enables you to add, subtract, multiply or divide a series of identical numbers without re-entering the numbers each time.

For example, to compound 7.5% interest on your 4-year \$1000 bank certificate of deposit, you would multiply 1.075 by itself four times ( $1.075^4$ ) and multiply the result by 1000 to determine the value after four years.

| Keyboard Entry    | Display | Comments                        |
|-------------------|---------|---------------------------------|
| $\times$<br>1.075 | 1.075   | (100 + 7.5)% entered as decimal |
| $\times$          | 1.075   |                                 |

|           |                                |
|-----------|--------------------------------|
| 1.155625  | $1.075^2 = 1.075 \times 1.075$ |
| 1.2422968 | $1.075^3$                      |
| 1.335469  | $1.075^4$                      |
| 1000      | 1000.                          |
|           | 1335.469                       |

Value at maturity

## CONSTANT MODE CALCULATIONS

15 This convenient feature increases the flexibility of your calculator by permitting you to automatically multiply or divide a series of identical numbers. It also operates in the add and subtract modes. In each case, the common (or identical) numbers must be the second number.

### CONSTANT MODE CALCULATIONS (Continued)

Example:  $3 \times 4$     $6 \times 4$     $8 \times 4$

|    | Keyboard Entry                   | Display                 | Comments                               |
|----|----------------------------------|-------------------------|--|
| 16 | 3<br>[x] 4 [=]<br>6 [=]<br>8 [=] | 3.<br>12.<br>24.<br>32. | 1st answer<br>2nd answer<br>3rd answer |

Example:  $7 \div 6$     $12 \div 6$     $36 \div 6$

|    | Keyboard Entry                     | Display                     | Comments                               |
|----|------------------------------------|-----------------------------|--|
| 16 | 7<br>[÷] 6 [=]<br>12 [=]<br>36 [=] | 7.<br>1.1666666<br>2.<br>6. | 1st answer<br>2nd answer<br>3rd answer |

In all instances, the constant is retained until a different number is entered after an arithmetic function key is depressed. The following example shows how the constant and constant function key change as new numbers and function keys are depressed.

$$\frac{(5 + 3) 3 - 2}{2} = 11$$

|    | Keyboard Entry                             | Display                                   | Comments  |
|----|--|---|---|
| 17 | 5<br>[+] 3<br>[x]<br>[÷] 2<br>[+] 2<br>[=] | 5.<br>3.<br>8.<br>24.<br>2.<br>22.<br>11. | Constant undetermined<br>Constant addend = 3<br>Constant multiplier = 3<br>Constant subtrahend = 3<br>Constant subtrahend = 2<br>Constant divisor = 2<br>Constant divisor = 2 |

## PERCENTAGE OPERATIONS

The percent key,  $\%$ , is a fully active percent feature. It will figure discounts, add-ons, mark-ups and totals (not just determine straight percentage as many other limited % function calculators). The examples below give you a greater appreciation of this feature.

**Example:** What is 15% of 200?

| Keyboard Entry | Display |
|----------------|---------|
| 200            | 200.    |
| $\boxtimes$ 15 | 15.     |
| $\%$           | 30.     |

**Example:** Suppose you have answered 57 of 65 examination questions correctly. What is your percentage of correct answers?

| Keyboard Entry | Display |
|----------------|---------|
| 57             | 57.     |
| $\div$ 65      | 65.     |
| $\%$           | 87.6923 |

**Example of Selling Price plus Sales Tax:** An article is purchased for \$12.95, not including 5% sales tax. What is the total cost to buyer?

| Keyboard Entry               | Display                    | Comments  |
|------------------------------|----------------------------|---|
| 12.95<br>$\oplus$ 5 $\%$ $=$ | 12.95<br>0.6475<br>13.5975 | Sales tax<br>Rounding off for \$ and<br>cents = \$13.60 |

Mark-up and discount operations can be chained if desired. For example, if a \$19.95 item is discounted by 15% and a 6% sales tax is added, what is the total cost?

**PERCENTAGE OPERATIONS (Continued )****Keyboard Entry      Display      Comments**

|                |          |                      |
|----------------|----------|----------------------|
| 19.95          | 19.95    |                      |
| $\boxed{-}$ 15 | 15.      |                      |
| $\boxed{\%$    | 2.9925   | Discount             |
| $\boxed{+}$    | 16.9575  | Discounted amount    |
| 6              | 6.       |                      |
| $\boxed{\%$    | 1.01745  | Sales tax            |
| $\boxed{=}$    | 17.97495 | Total cost (\$17.97) |

**REGISTER EXCHANGE OPERATION**

Another useful feature of your EC-415 is the register exchange capability, "EX". Depressing the **[EX]** key exchanges the data (number) in the display with the number in the constant register (the previously displayed number).

Problem:  $\frac{15}{3 + 6} = 1.6666666$

| Keyboard Entry | Display   | Register | Constant Register |
|----------------|-----------|----------|-------------------|
| 3              | 3.        | 3.       | Undetermined      |
| $\boxed{+}$    | 3.        | 3.       |                   |
| 6              | 6.        | 6.       |                   |
| $\boxed{-}$    | 9.        | 9.       |                   |
| 15             | 15.       | 9.       |                   |
| <b>[EX]</b>    | 9.        | 15.      |                   |
| $\boxed{=}$    | 1.6666666 | 9.       |                   |

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**CLEAR OPERATIONS**

1. A single depression of the **[C]** key after entry of a number clears the displayed number but does not affect the stored constants or the operation in progress.

## CLEAR OPERATIONS (Continued)

**Problem:**  
**Entry Correction:**  $12 + 5.5 = 17.5$

|    | Keyboard Entry                   | Display                         | Comments                       |
|----|----------------------------------|---------------------------------|--------------------------------|
| 22 | 12<br>+ 5.6<br>[C]<br>5.5<br>[=] | 12.<br>5.6<br>0.<br>5.5<br>17.5 | Error; wrong number<br>Cleared |

2. A single depression of the [C] key after an arithmetic function key, answer key, or exchange key clears the calculator (except the memory).

|    | Keyboard Entry              | Display                     | Comments   |
|----|-----------------------------|-----------------------------|--|
| 23 | 4<br>[+]<br>6<br>[x]<br>[C] | 4.<br>4.<br>6.<br>10.<br>0. | Error; intended to depress [F] key.<br>Cleared calculator. (See Recovery Techniques, page 41). |

3. A double depression of the [C] key clears any operation in progress and clears the calculator (except the memory).

|    | Keyboard Entry         | Display              | Comments                            |
|----|------------------------|----------------------|-------------------------------------|
| 23 | 2<br>+ 3<br>[C]<br>[C] | 2.<br>3.<br>0.<br>0. | Entry cleared<br>Calculator cleared |

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## CLEAR OPERATIONS (Continued)

- Depressing the **[C]** key during an overflow (see Overflow Conditions) cancels the overflow condition. The number in the display is correct if multiplied by  $10^8$  (100,000,000) and may be used in further calculations. Chain and constant operations are not affected by overflowing.

**24 Problem:**  
**Clear Error (Overflow):**  $12345678 \times 9 = 111111102$

| Keyboard Entry | Display        | Comments   |
|----------------|----------------|--|
| 12345678       | 12345678.      |  |
| <b>[x] 9</b>   | 9.             | Overflow Indicator lights; calculator accepts only clear entry |
| <b>[=]</b>     | 1.1.1.1.1.1.0. |  |

**[C]** 1.1111110 Answer must be multiplied by  $10^8$  (see Wrap-Around Decimal).

- Depressing the (CF) key after pressing the **[E]** key clears the secondary function operation and restores the previous conditions (see page 41).
- Depressing the **[E]** and (MC) keys clears the memory (see Memory Operation).

## 25 OVERFLOW CONDITIONS

The following operations result in an overflow condition which causes the Overflow Indicator, all decimal points, to light and all keys except **[C]** to become inoperative:

- Any answer or subtotal exceeding 8 whole digits to the left of the decimal point, regardless of the arithmetic sign (absolute value greater than 99,999,999). The 8 most significant digits are displayed as follows: **[X.X.X.X.X.X.X.]**. Calculations can be continued, if desired (see Wrap-Around Decimal).

2. A memory accumulation exceeding 8 whole digits to the left of the decimal point, regardless of the arithmetic sign. The number to be added to the memory remains in the display with leading zeroes sufficient to fill the display: 0.0.0.0.0.XX.. The number in the memory is unaffected. Depressing the **C** clears the overflow condition and the number remains in the display: XXXX.
3. Division by zero. All zeroes and decimal points are displayed:  
0.0.0.0.0.0.

### WRAP-AROUND DECIMAL

The wrap-around decimal feature of your calculator lets you proceed when the answer obtained in the display exceeds the capacity of the calculator ( $10^8$  or greater). The calculator automatically retains the 8 most significant digits, places the decimal point 8 positions to the left of its true position, and lights the Overflow Indicator. You may proceed with the problem solution after depressing the **C** key

once to clear the overflow condition, but you must multiply the final problem answer by  $10^8$  ( $100,000,000$ ) or move the decimal point 8 places to the right. Any numbers subsequently added or subtracted must be divided by  $10^8$  before entering. If two overflows occur in the same problem, the final answer must be multiplied by  $10^8 \times 10^8 = 10^{16}$  and so on.

**Example:**  $\frac{98,000,000 \times 2,000}{0.04} - 20,000,000 = 4,899,980,000,000$

| Keyboard Entry  | Display   | Comments   |
|---|---|--|
| 98000000<br>[ <b>X</b> ] 2000<br>[ <b>±</b> ]<br>[ <b>C</b> ] | 98000000.<br>2000.<br>1.9.6.0.0.0.0.<br>1960.0000 | Overflow Indicator lights<br>Displayed number times $10^8$<br>equals true number |

**WRAP-AROUND DECIMAL (Continued)**

|         |  |
|---------|--|
| .04     |  |
| 0.04    |  |
| 49000.  |  |
| 0.2     |  |
|         | Number entered<br>$(20000000 \div 10^8) = 0.2$ |
|         | This answer times $10^8$ equals<br>true answer |
| 48999.8 |  |

**COMPUTATIONS WITH VERY LARGE OR VERY SMALL NUMBERS**

Computations can be made with numbers which are too large or too small for the capacity of the calculator by scaling (shifting the decimal point to the left, or to the right) before entering the number. The decimal point in the answer must then be shifted in the opposite direction. For example, to multiply  $0.0000019 \times 0.000017$  you must first scale at least one of the numbers or your calculator will display an answer of zero because the first non-zero number in the answer (.00000000323) is beyond

the 8-digit capacity of the calculator. However, if you shift the decimal point to the right of the number in each number (for maximum accuracy), you will obtain the correct number in the answer and you will only need to position the decimal point. In this instance, a shift of 7 decimal places to the right in one number and 5 decimal places to the right in the other would require a 12 (7 + 5) decimal place shift to the left in the answer. For example:

| Keyboard Entry  | Display                 | Comments                              |
|---|-------------------------|---------------------------------------|
| 19<br>17<br><input checked="" type="checkbox"/> 323.<br>= | 19.<br>17.<br>323.<br>= | The correct answer is<br>.00000000323 |

## MEMORY OPERATION

Your EC-415 has a completely independent memory which is unaffected by arithmetic or scientific operations. Through the use of this memory, you can perform chain operations involving complex mathematical problems with a minimum of key depressions. All of the memory operation keys are activated by depressing the **F** key. The functions of the memory operation keys are as follows:

| Key  | Function   |
|------|--|
| (MC) | Clear memory. The displayed number and any functions are not affected. |
| (M+) | Add to memory.   |
| (M-) | Subtract from memory.  |
| (MR) | Display number in memory.  |
| (EM) | Exchange number being displayed with number in memory.                 |

The following example illustrates use of the memory operation keys and the memory clearing procedure.

| Keyboard Entry | Display | Memory | Comments   |
|----------------|---------|--------|--|
| <b>C</b>       | 0.      | 0      | Memory cleared; display not altered  |
| <b>F</b> (MC)  | 0.      | *      |  |
| 4              | 4.      | 4.     |  |
| <b>F</b> (M+)  | .       | 4.     | → Displayed number added to memory; display not altered.<br>Memory Indicator lights. |
| 3              | :       | 3.     | Multiply operation established.  |
| <b>F</b> (M-)  | 3.      | 4.     | Displayed number subtracted from memory; display not altered.                        |

**(Continued on Page 32)**

\* The memory is automatically cleared when the calculator is turned on. Consequently, the memory will contain zero if it has not been previously used. If the memory has been used and has not been cleared since turning the calculator on, the memory contains the last stored value. A non-zero memory is indicated by a dot in the far left position of the display.

### MEMORY OPERATION (Continued)

|    | Keyboard         | Entry | Display | Memory | Comments   |
|----|------------------|-------|---------|--------|--|
| 32 | $\boxed{+}$      | .     | 12.     | 1.     | $(3 \times 4)$ executed and addition operation established.                        |
|    | $\boxed{F}$ (MR) | .     | 1.      | 1.     | Contents of memory recalled to display; original number moved to working register. |
|    | $\boxed{E}$ (EM) | .     | 13.     | 1.     | $(12 + 1)$ executed.   |
|    |                  |       | 1.      | 13.    | Contents of memory exchanged with displayed number.                                |

The flexible fully-addressable memory in your EC-415 allows you to solve many problems which cannot be solved (without pencil and paper) by ordinary calculators, or which are cumbersome with calculators with ordinary store/recall memories. For example, first try to solve the following problem without using memory. Then see how easy it is with your calculator.

**Problem:**  $7/8 + 3/32 - 9/16 = 0.40625$

|    | Keyboard         | Entry | Display | Memory | Comments                           |
|----|------------------|-------|---------|--------|------------------------------------|
| 33 | $\boxed{F}$ (MC) |       | 0.      | 0      | Ensure you start with 0 in memory. |
|    | 7                |       | 7.      | 0      |                                    |
|    | $\boxed{\div}$ 8 |       | 8.      | 0      |                                    |
|    | $\boxed{E}$      |       | 0.875   | 0      |                                    |
|    | $\boxed{F}$ (M+) | .     | 0.875   | 0.875  |                                    |

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**MEMORY OPERATION (Continued)**

|    | Keyboard Entry     | Display | Memory  | Comments                     |
|----|--------------------|---------|---------|------------------------------|
|    | 3                  | 3.      | 0.875   |                              |
|    | 32                 | 32.     | 0.875   |                              |
|    | [ $\square$ ]      | 0.09375 | 0.875   |                              |
|    | [ $\square$ ] (M+) | 0.09375 | 0.96875 | (0.875 + 0.09375) in memory  |
| 34 | 9                  | 9.      | 0.96875 |                              |
|    | [ $\square$ ]      | 16.     | 0.96875 |                              |
|    | [ $\square$ ]      | 0.5625  | 0.96875 |                              |
|    | [ $\square$ ] (M-) | 0.56250 | 0.40625 | (0.96875 - 0.5625) in memory |
|    | [ $\square$ ] (MR) | 0.40625 | 0.40625 |                              |

Most memory problems can be solved in a variety of ways with your EC-415. Some ways are slightly more efficient than others. Experiment to find the approach that is most natural for you. As an example, two alternate solutions are shown for the following problem.

$$\text{Problem: } \frac{5 + 6}{7 - 9} = -5.5$$

**Solution No. 1**

|  | Keyboard Entry     | Display | Memory |                    |     |
|--|--------------------|---------|--------|--------------------|-----|
|  | [ $\square$ ] (MC) | 0.      | 0      | [ $\square$ ] (MC) | 0.  |
|  | 5                  | 5.      | 0      | [ $\square$ ] (M+) | 7.  |
|  | [ $\square$ ]      | 6.      | 0      | [ $\square$ ] (M-) | 9.  |
|  | [ $\square$ ]      | 11.     | 0      | [ $\square$ ]      | 5.  |
|  | [ $\square$ ] (M+) | 11.     | 11.    | [ $\square$ ]      | 6.  |
|  | 7                  | 7.      | 11.    | [ $\square$ ]      | 11. |
|  | [ $\square$ ]      | 9.      | 11.    | [ $\square$ (MR)]  | 2.  |
|  | [ $\square$ ]      | -       | 11.    | [ $\square$ ]      | 5.5 |
|  | [ $\square$ ] (EM) | -       | -2.    |                    | -2. |
|  | [ $\square$ ]      | -       | -2.    |                    | -2. |
|  |                    |         | 5.5    |                    |     |

**Solution No. 2**

|  | Keyboard Entry     | Display | Memory |                   |     |
|--|--------------------|---------|--------|-------------------|-----|
|  | [ $\square$ ]      | 0.      | 0      | [ $\square$ ]     | 0.  |
|  | 5                  | 5.      | 0      | [ $\square$ ]     | 7.  |
|  | [ $\square$ ]      | 6.      | 0      | [ $\square$ ]     | 9.  |
|  | [ $\square$ ]      | 11.     | 0      | [ $\square$ ]     | 5.  |
|  | [ $\square$ ] (M+) | 11.     | 11.    | [ $\square$ ]     | 6.  |
|  | 7                  | 7.      | 11.    | [ $\square$ ]     | 11. |
|  | [ $\square$ ]      | 9.      | 11.    | [ $\square$ (MR)] | 2.  |
|  | [ $\square$ ]      | -       | 11.    | [ $\square$ ]     | 5.5 |
|  | [ $\square$ ] (EM) | -       | -2.    |                   | -2. |
|  | [ $\square$ ]      | -       | -2.    |                   | -2. |
|  |                    |         | 5.5    |                   |     |

**SQUARE (X<sup>2</sup>)**

Depressing the  $\boxed{\text{E}}$  and  $(\text{X}^2)$  keys causes the square of the displayed number to be computed and displayed. Your EC-415 calculator will allow you to chain  $\text{x}^2$ ,  $\sqrt{\text{x}}$ , and  $1/\text{x}$  operations. (See the sample problems on pages 42-45.)

**Problem:**  $5^2 = 25$

| Keyboard Entry                       | Display |
|--------------------------------------|---------|
| 5<br>$\boxed{\text{E}} (\text{X}^2)$ | 25.     |

**SQUARE ROOT ( $\sqrt{\text{x}}$ )**

Depressing the  $\boxed{\text{E}}$  and  $(\sqrt{\text{x}})$  keys causes the square root of the number being displayed to be computed and displayed. Note: If you inadvertently try to calculate the square root of a negative number your calculator will compute the square root of the absolute value of x and display the answer with a minus sign. (Mathematically, the square root of a negative number is imaginary.)

**Problem:**  $\sqrt{81} = 3$

| Keyboard Entry                             | Display |
|--|---------|
| 81<br>$\boxed{\text{E}} (\sqrt{\text{x}})$ | 3.      |

**RECIPROCALS (1/X)**

Depressing the  $\boxed{\text{E}}$  and  $(1/\text{x})$  keys causes the reciprocal of the number being displayed to be computed and displayed.

**Problem:**  $1/20 = 0.05$

|                                       |      |
|---------------------------------------|------|
| 20<br>$\boxed{\text{E}} (1/\text{x})$ | 0.05 |
|---------------------------------------|------|

### CHAINING MEMORY AND $x^2$ , $\sqrt{x}$ , and $1/x$ OPERATIONS

The chaining of the memory and  $x^2$ ,  $\sqrt{x}$ , and  $1/x$  capability makes your EC-415 calculator a useful tool for solving problems in statistics. The following example illustrates the use of this feature.

**Problem:** Determine the sum and the sum of the squares of the following numbers:

2, 3, 4, 5

| Keyboard Entry    | Display | Memory | Comments                          |
|-------------------|---------|--------|-----------------------------------|
| $\boxed{E} (M+)$  | 2.      | 0.     |                                   |
| $\boxed{E} (x^2)$ | 2.      | 2.     | $2^2$                             |
| $\boxed{+}$       | 4.      | 4.     | $2^2 +$                           |
| $\boxed{E} (M+)$  | 4.      | 4.     |                                   |
| $\boxed{E} (x^2)$ | 4.      | 8.     | $2^2 + 4^2$                       |
| $\boxed{+}$       | 8.      | 8.     | $2^2 + 4^2 +$                     |
| $\boxed{E} (M+)$  | 8.      | 16.    | $2^2 + 4^2 + 8^2$                 |
| $\boxed{E} (x^2)$ | 16.     | 29.    | $2^2 + 4^2 + 8^2 + 16^2$          |
| $\boxed{+}$       | 29.     | 29.    | $2^2 + 4^2 + 8^2 + 16^2 +$        |
| $\boxed{E} (M+)$  | 29.     | 54.    | $2^2 + 4^2 + 8^2 + 16^2 + 54^2$   |
| $\boxed{E} (x^2)$ | 54.     | 14.    | $54^2$                            |
| $\boxed{+}$       | 14.     | 14.    | Sum of the squares of the numbers |
| $\boxed{E} (MR)$  | .       | .      | Sum of the numbers                |

### CHANGE SIGN (+/−)

Depressing the **[F]** and **(+/-)** keys changes the sign of the number in the display. The EC-415 allows sign change at any point in a calculation.

**Problem:**  $\frac{4^2(-3)}{6} = -8$

| Keyboard Entry   | Display |
|------------------|---------|
| 4                | 4.      |
| [ <b>X</b> ]     | 4.      |
| [ <b>X</b> ]     | 4.      |
| 16.              |         |
| 3                | 3.      |
| <b>[F] (+/-)</b> | 3.      |
| <b>[F]</b>       | 3.      |
| 48.              |         |
| 6                | 6.      |
| [ <b>≡</b> ]     | 6.      |
|                  |         |
|                  |         |

### RECOVERY TECHNIQUES

Occasionally you may unintentionally depress an incorrect function key. The following techniques allow easy correction without loss of the displayed number.

**Unintentional [E]:** Depressing the (CF) key immediately after an unintentional [**E**] key clears the calculator of secondary function operation.

**Problem:**  $4 \times 3 = 12$

| Keyboard Entry | Display | Comments                          |
|----------------|---------|-----------------------------------|
| 4              | 4.      |                                   |
| [ <b>X</b> 3   | 3.      |                                   |
| <b>[E]</b>     | 3.      | Error!! Did not want to press [E] |
| (CF)           | 3.      |                                   |
| [ <b>≡</b> ]   | 12.     |                                   |

(Continued on Page 42)

## RECOVERY TECHNIQUES (Continued)

Unintentional  $\times$  or  $\div$ : Depress 1, then the correct arithmetic function key. If constant multiplication or division is being performed, the constant is replaced by 1.

Unintentional  $\pm$  or  $\mp$ : Depress 0, then the correct arithmetic function key. If constant addition or subtraction is being performed, the constant is replaced by 0.

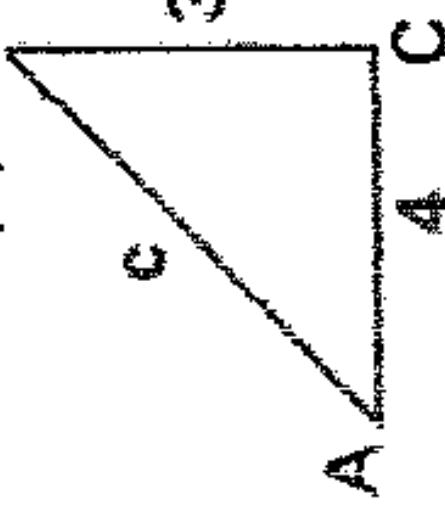
42

## SAMPLE PROBLEMS

Your Radio Shack EC-415 Slide Rule Memory calculator is a versatile problem solving tool. Several practical examples were chosen from different fields of interest to familiarize you with the calculator. We recommend that you gain familiarity with your EC-415 by working the sample problems.

### Problem:

**THE PYTHAGOREAN THEOREM:** Given righttriangle ABC with sides 3 and 4, find the hypotenuse (c).



$$\text{Formula } c = \sqrt{3^2 + 4^2} = 5$$

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(Continued on Page 44)

### THE PYTHAGOREAN THEOREM (continued)

| Keyboard Entry                  | Display | Comments       |
|---------------------------------|---------|----------------|
| 3                               | 3.      |                |
| $\boxed{\mathbb{E}} (X^2)$      | 9.      |                |
| $\boxed{+}$ 4                   | 4.      |                |
| $\boxed{\mathbb{E}} (X^2)$      | 16.     |                |
| $\boxed{=}$                     | 25.     |                |
| $\boxed{\mathbb{E}} (\sqrt{x})$ | 5.      | Hypotenuse (c) |

#### Problem:

**PARALLEL RESISTORS:** Three resistors of 5 ohms, 20 ohms and 10 ohms are connected in parallel. What is the equivalent resistance?

Formula:  $R_{\text{equivalent}} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$

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45

| Keyboard Entry             | Display   | Comments                |
|----------------------------|-----------|-------------------------|
| 5                          | 5.        | $R_1$                   |
| $\boxed{\mathbb{E}} (1/X)$ | 0.2       | $1/R_1$                 |
| $\boxed{+}$                | 0.2       |                         |
| 20                         | 20.       | $R_2$                   |
| $\boxed{\mathbb{E}} (1/X)$ | 0.05      | $1/R_2$                 |
| $\boxed{+}$                | 0.05      | $1/R_1 + 1/R_2$         |
| 10                         | 0.25      | $R_3$                   |
| $\boxed{\mathbb{E}} (1/X)$ | 0.1       | $1/R_3$                 |
| $\boxed{=}$                | 0.35      | $1/R_1 + 1/R_2 + 1/R_3$ |
| $\boxed{\mathbb{E}} (1/X)$ | 2.8571428 | Equivalent resistance   |

**Problem:**  
**INVOICE CALCULATIONS**

24 spark plugs at \$1.08 each  
 24 condensers at \$0.35 each  
 24 filters at \$2.81 each

Net total  
 6% sales tax  
 Gross total

Keyboard Entry      Display      Memory      Comment

0  
 (MC) 0  
 1.08 1.08  
 24 24.

24 becomes standard  
 multiplier

46

25.92 0  
 (M+) 25.92 25.92  
 .35 0.35 25.92  
 8.4 8.4 25.92  
 (M+) 8.40 34.32  
 2.81 2.81 34.32  
 67.44 67.44 34.32  
 67.44 67.44 34.32  
 (MR) 34.32 34.32  
 6 101.76 34.32 Net total  
 % 6 34.32 Sales tax  
 = 6.1056 34.32 Gross total  
 107.8656

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### **LIMITED WARRANTY**

This electronic calculator from Radio Shack is warranted to the original purchaser for a period of one year from the original purchase date—under normal use and service—against defective materials or workmanship.

Defective parts will be repaired, adjusted and/or replaced at no charge when the calculator is returned to any Radio Shack store.

The warranty is void if the calculator has been visibly damaged by accident, misuse, or if the calculator has been serviced or modified by any person other than Radio Shack personnel.

This warranty contains the entire obligation of Radio Shack and no other warranties expressed, implied, or statutory are given.

To assure proper handling and servicing of your calculator under the one-year warranty, you must return your calculator with a copy of the sales receipt (or other proof of purchase date). Calculators returned without proof of purchase date will be serviced out-of-warranty at our prevailing service rates.

Date of Purchase

Serial Number

**KEEP THIS IN A SAFE PLACE**

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**C**

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**CANADA: BARRIE, ONTARIO, CANADA L4M 4W5**

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